CONCENTRATED DISADVANTAGE AND INTIMATE PARTNER VIOLENCE

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**ABSTRACT**

AUBREY L. SPRIGGS: Concentrated Disadvantage and Intimate Partner Violence
(Under the Direction of Carolyn Tucker Halpern)

Research documents numerous individual-level risk factors for adolescent dating violence victimization, as well as an association between area concentrated disadvantage (i.e., areas characterized by high poverty, unemployment, and residential turnover) and partner violence among adults. However, little is known about contextual contributors to adolescent dating violence (DV). Although concentrated disadvantage has been linked to the most severe form of intimate partner violence – partner homicide (IPH) – most such studies have been conducted in urban areas, and have examined only female-victim IPH. In this dissertation, I approach partner violence from an ecological perspective and apply social science theories to predict relationships between contextual disadvantage and partner violence outcomes. In my first paper, I assess the relationship between school disadvantage and adolescent dating violence victimization using data from the National Longitudinal Study of Adolescent Health (n=10,620). In multilevel random effects models controlling for individual and school sociodemographic characteristics, school disadvantage is found to moderate the association between family disadvantage and girls' victimization. However, school disadvantage was unrelated to boys' victimization. In the second paper I explore the ecological relationship between disadvantage and intimate partner homicide rates in North Carolina counties (n=100) using data from the North Carolina Violent Death Reporting System, the 2000 Census, and the North Carolina Council for Women's annual survey of NC domestic violence programs. Using Poisson regression models with population offset terms and controlling for percent of the population age 20-40 years, female-to-male sex ratio, and sex ratio squared, I found county disadvantage was positively related to male-victim IPH but not

significantly associated with female-victim IPH; neither relationship varied by county rurality. Further, domestic violence service availability and funding variables were not supported as mediators between county disadvantage and male-victim IPH. Results suggest that contextual disadvantage may have direct or moderating effects on partner violence outcomes, depending on the gender of the victim, age of study participants, severity of outcome studied, and level of data utilized. Future studies should examine the relationship between contextual disadvantage and other partner violence outcomes (e.g., severe victimization and various levels of perpetration) as well as mechanisms by which contextual disadvantage affects such outcomes.

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**CHAPTER 1: Introduction**

Intimate partner violence (IPV) is defined as violence or threat of violence in a close relationship, including current or former spouses and dating partners (National Center for Injury Prevention and Control, 2006). In the 1995-96 school year, twelve percent of U.S. adolescents in opposite-sex romantic relationships reported experiencing physical victimization in a dating relationship in the preceding 18 months (Halpern, Oslak, Young, Martin, & Kupper, 2001). Data from the 1995 National Violence Against Women Survey estimated that women age 18 and older experience 4.8 million intimate partner assaults annually, and that adult men experience 2.9 million such assaults (Tjaden & Thoennes, 2000). Intimate partner violence, both during adolescence and later in life, is associated with many of the health targets identified in Healthy People 2010, including overweight and obesity, tobacco use, substance abuse, responsible sexual behavior, mental health, injury and violence, and access to health care (Decker, Silverman, & Raj, 2005; Family Violence Prevention Fund; Olshen, McVeigh, Wunsch-Hitzig, & Rickert, 2007; Roberts, Auinger, & Klein, 2005; Roberts, Klein, & Fisher, 2003; Silverman, Raj, & Clements, 2004). Further, persons with a history of adolescent partner violence are more likely than others to be victims of IPV later in life (Family Violence Prevention Fund; Lehrer, Buka, Gortmaker, & Shrier, 2006; Smith, White, & Holland, 2003). Victims of repeated violence over time experience more serious consequences than victims of one-time incidents (Johnson & Leone, 2005). Given the immediate health consequences of adolescent partner violence victimization, as well as its connection to partner violence victimization later in life, the prevention of and effective intervention in adolescent partner violence has been recognized as a public health priority.

Most research on adolescent dating violence to date has focused on proximal individual, familial and peer determinants of victimization. These studies have found salient proximal risk factors to include low self esteem, depressive symptoms, problematic alcohol use (especially binge drinking), a history of family violence, early sexual debut, having friends who are involved in dating violence, and an attitude of tolerance toward violence in dating relationships (Arriaga & Foshee, 2004; Buzy, et al., 2004; Foshee, Benefield, Ennett, Bauman, & Suchindran, 2004; Foshee, Ennett, Bauman, & Suchindran, 2005; Gagne, Lavoie, & Hebert, 2005; Lehrer, et al., 2006; Moretti, Obsuth, Odgers, & Reebye, 2006; Wolfe, Wekerle, Scott, Straatman, & Grasley, 2004). Although one study found that students in large schools were more likely than others to experience dating violence victimization (Halpern, et al., 2001), surprisingly little else is known about broader contextual contributors to adolescent dating violence.

Past research has found neighborhood (usually operationalized as Census tracts) and school socioeconomic disadvantage are significantly related to adolescent health and risk behaviors (e.g., depressive symptoms, early sexual activity, alcohol use, and delinquency) above and beyond individual and family-level characteristics (Browning, Leventhal, & Brooks-Gunn, 2004; Cubbin, Santelli, Brindis, & Braveman, 2005; Harris, Duncan, & Boisjoly, 2002; Haynie, Silver, & Teasdale, 2006; Hoffmann, 2006; Khoury-Kassabri, Benbenishty, Astor, & Zeira, 2004; O'Malley, Johnston, Bachman, Schulenberg, & Kumar, 2006; O'Malley, Johnston, Delva, Bachman, & Schulenberg, 2007; Oetting, Donnermeyer, & Deffenbacher, 1998; Wilcox, 2003; N. Wilson, Syme, Boyce, Battistich, & Selvin, 2005). Such health and risk behaviors in turn have been found to be associated with increased likelihood of adolescent partner violence victimization (Buzy, et al., 2004; Ozer, Tschann, Pasch, & Flores, 2004; Ramisetty-Mikler, Goebert, Nishimura, & Caetano, 2006). Neighborhood characteristics have also been found to modify the relationship between familial risk and protective factors and adolescent health behaviors. For example, parental monitoring is more strongly protective against adolescent sexual initiation in neighborhoods with lower collective monitoring (Browning, Leventhal, & Brooks-Gunn, 2005);

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further, living in a middle-income versus a low-income neighborhood is associated with a greater likelihood of peer rejection among children from high-risk families (Kupersmidt, Griesler, DeRosier, Patterson, & Davis, 1995). Given these findings, it is plausible that contextual characteristics could affect risk of adolescent partner violence victimization either directly through the same mechanisms affecting other health risk behaviors, indirectly though their influence on risk behaviors that place adolescents at a higher risk for victimization, or by modifying the influence of more proximal dating violence risk factors.

The most severe consequence of intimate partner violence is intimate partner homicide. From 1976 to 2005, about 11% of homicide victims were killed by an intimate partner (Fox & Zawitz, 2004). In 2005, 329 males and 1,181 females in the U.S. were killed by an intimate partner (Fox & Zawitz, 2007). There has been a decrease in the number of intimate partner homicides between 1976 and 2005; this decrease was greater for males compared to females (Catalano, 2006; Fox & Zawitz, 2007). Rates of intimate partner homicide also declined in the last two decades for most partner types (Puzone, Saltzman, Kresnow, Thompson, & Mercy, 2000).

A number of studies have linked neighborhood and state-level poverty and disadvantage to female-victim intimate partner homicide rates (Browning, 2002; Frye & Wilt, 2001; Grana, 2001). Further, county disadvantage has been negatively associated with shelter services availability, and the availability of such victims' services is inversely related to partner homicide rates (Dugan, Nagin, & Rosenfeld, 1999; Dugan, Rosenfeld, & Nagin, 2003; Tiefenthaler, Farmer, & Sambira, 2005). Therefore one mechanism by which community disadvantage may impact intimate partner homicide rates is through this differential distribution of preventive services.

### Research Questions

The research in this dissertation explores the relationship between contextual disadvantage and partner violence outcomes in both adolescence and adulthood. It is structured as

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two related papers, followed by a summary and overall conclusions. A more in-depth exploration of relevant literature, as well as theoretical models, is undertaken in each paper.

*Paper 1:* How are family and school socioeconomic disadvantage related to adolescent dating violence victimization? This paper explores whether family and school disadvantage are directly and/or conditionally related to adolescent dating violence victimization after controlling for individual and school demographic characteristics, as well as whether these relationships are similar across victim gender.

*Paper 2:* What is the relationship between county disadvantage and intimate partner homicide rates in North Carolina? This paper investigates the relationship between county disadvantage and both male-victim and female-victim intimate partner homicide, whether these associations are moderated by county rurality, and whether such associations are mediated by victims' services availability and funding.

Partner violence victimization is a prevalent problem in the United States, affecting between 25% to 31% of women and 8% to 12% of men in their lifetime (Black & Breiding, 2008; The Commonwealth Fund, 1999; Tjaden & Thoennes, 2000). Partner violence victimization has numerous negative health and social consequences, as well as a high economic cost. However, an understanding of the etiology of partner violence is largely limited to individual and family-of-origin risk factors. Given the centrality of an ecological model of health in public health (Gebbie, Rosenstock, & Hernandez, 2003), an investigation of how wider systems and social conditions influence risk and the social patterning of partner violence is an important next step in partner violence research.

This project contributes novel information regarding the influences of multiple ecological levels on adolescent dating violence victimization, including an examination of how such influences vary by victim gender. The project also tests the applicability of social disorganization theory to intimate partner homicide across victim gender and different levels of area urbanicity, and describes county-level disparities in these rates in North Carolina.

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**CHAPTER 2: Family and School Socioeconomic Disadvantage: Interactive Influences on Adolescent Dating Violence Victimization**

**Introduction**

Dating violence is a serious and prevalent problem in the United States. In the 1995-96 school year, thirty percent of adolescents in opposite-sex romantic relationships reported psychological or physical victimization in one or more relationships in the preceding 18 months (Halpern, et al., 2001). Many negative health consequences have been documented in connection with dating violence, including suicide attempts, illicit drug use, sexually transmitted infections, adolescent pregnancy, and adult partner violence (Decker, et al., 2005; Lehrer, et al., 2006; Olshen, et al., 2007; Roberts, et al., 2005; Roberts, et al., 2003; Silverman, et al., 2004). In addition, a longer duration of victimization is associated with more severe health consequences (Bonomi, et al., 2006). Given the high prevalence of adolescent partner violence, and its effects on health and developmental outcomes, understanding its etiology is of concern to researchers and policymakers.

Research on adolescent dating violence has identified a number of individual and familial risk factors for victimization. Such factors include negative psychological states, such as low self esteem and depressive symptoms; risk behaviors, including problematic alcohol use and early sexual debut; and having role models for intimate partner violence, including both friends and parents (Arriaga and Foshee 2004; Buzy et al. 2004; Foshee et al. 2004; Foshee et al. 2005; Gagne, Lavoie and Hebert 2005; Lehrer et al. 2006; Moretti et al. 2006; Wolfe et al. 2004). Such research provides knowledge regarding risk factors that can be targeted in interventions, but does not address how adolescent partner violence is influenced by wider structural forces. The

purpose of this paper is to extend the understanding of adolescent dating violence victimization by examining its relationship to family and school socioeconomic disadvantage.

*Individual/Family Socioeconomic Disadvantage*

Although partner violence affects couples in all socioeconomic strata, a number of studies have demonstrated a negative relationship between socioeconomic status and violence among adults (Aldarondo & Sugarman, 1996; Breiding, Black, & Ryan, 2008; Cunradi, Caetano, & Schafer, 2002). Some researchers hypothesize that the financial strain and social isolation that can result from lower socioeconomic status create stress in adult relationships, that in turn increases the likelihood of adult partner violence (Straus, Gelles, & Steinmetz, 1980). Whether this differential risk by socioeconomic status begins in adolescence, however, is unclear. Family-of-origin socioeconomic status could influence adolescent dating violence through adolescent risk behaviors or mental health, through increasing exposure to family violence, or by influencing the adoption of traditional gender role ideologies. Although in some studies family-of-origin socioeconomic status (measured in a number of ways) was found to be significantly inversely related to dating violence victimization and perpetration (Foshee, Benefield, et al., 2008; Foshee, Karriker-Jaffe, et al., 2008; Halpern, et al., 2001; O'Keefe, 1998), it was unrelated in others (Foshee, et al., 2004; Foshee, Linder, MacDougall, & Bangdiwala, 2001; O'Keefe & Treister, 1998). However, because studies of dating violence have primarily focused on studying other factors while controlling for socioeconomic status, they may underestimate socioeconomic status effects by including variables that mediate between socioeconomic status and dating violence outcomes. Further, because most such studies have relied upon geographically restricted samples, it is unclear whether findings generalize to a wider population.

*Contextual Socioeconomic Disadvantage*

Research examining neighborhood contexts and partner violence has focused primarily on adult populations. In ecological analyses, Browning (2002) found that neighborhood disadvantage in Chicago was positively related to intimate partner homicide; however,

disadvantage was unrelated to individual-level severe partner violence victimization after individual sociodemographic, social support, and relational characteristics were controlled (Browning, 2002). In another study using data from a nationally-representative sample of adult couples in the U.S., authors found that for both black and white couples, neighborhood poverty was positively associated with female-to-male partner violence; however, neighborhood poverty was positively associated with male-to-female partner violence among black couples only (Cunradi, Caetano, Clark, & Schafer, 2000).

The influence of contextual disadvantage is understudied in the adolescent dating violence literature, despite findings that contextual disadvantage is significantly related to many risk factors for dating violence. For example, neighborhood disadvantage (i.e., high poverty, unemployment, and residential turnover) and school disadvantage (i.e. percent of poor students or families on public assistance) have been associated with depression, early sexual activity, and substance use (Cubbin, et al., 2005; Harris, et al., 2002; O'Malley, et al., 2006; Oetting, et al., 1998; Wight, Botticello, & Aneshensel, 2006). The one study we identified that explored the relationship between contextual disadvantage and adolescent dating violence found that neighborhood disadvantage (defined using percent below poverty, unemployed, nonwhite, renting housing, and female-headed household) was unrelated to dating violence perpetration trajectories in either crude or adjusted analyses (Foshee, Karriker-Jaffe, et al., 2008). However, as the study was conducted in one rural North Carolina county, generalizability, especially to urban contexts, may be limited. Further, the authors did not explore if these associations varied by gender.

*Interaction Between Individual and Contextual Disadvantage*

Another possibility not yet examined in the adolescent dating violence literature is that the influence of family disadvantage on dating violence varies by contextual disadvantage. Such an interaction may explain why prior findings regarding family socioeconomic status have been mixed. In the adult partner violence literature, the influence of individual socioeconomic status has been found to vary across couple contexts, and by gender. Males with relatively lower

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educational or occupational status than their female partner have been found more likely to perpetrate multiple forms of violence, although females' relative disadvantage has been unrelated to their perpetration (Anderson, 1997; Atkinson, Greenstein, & Lang, 2005; Hornung, McCullough, & Sugimoto, 1981). Variation in the influence of family socioeconomic status by contextual disadvantage has also been supported among other adolescent health outcomes. For example, being relatively socioeconomically disadvantaged within the school or neighborhood has been associated with steeper decreases in self-esteem in the transition to middle school, especially among male adolescents (Rhodes, Roffman, Reddy, Fredriksen, & Way, 2004). Given low self-esteem is a recognized risk factor for dating violence (Pflieger & Vazsonyi, 2006), a connection between relative disadvantage and dating violence seems plausible.

*Theoretical Model*

This analysis draws upon social disorganization theory, relative deprivation theory, and gendered resource theory in exploring how family and school socioeconomic disadvantage relate to adolescent dating violence victimization. According to social disorganization theory, the material and structural resources of communities affect social cohesion, and subsequently communities' effectiveness in regulating residents' behavior (Sampson, 1997; Sampson, Raudenbush, & Earls, 1997). Empirically, school disadvantage has been negatively associated with parent involvement (Hooverdempsey, Bassler, & Brissie, 1987). When a substantial number of parents do not participate in school activities, the development of bonds and informal networks between parents within that school may be negatively affected. As in neighborhood social settings, without this "network closure" (Coleman, 1988), the collective monitoring and social control of adolescent behavior likely will be weaker. The social bonds between parents within schools should be influential in adolescent dating violence, given the importance of school settings in the formation of adolescent intimate relationships (Ford, Sohn, & Lepkowski, 2001; Ford, Sohn, & Lepkowski, 2003). One implication of social disorganization theory is that contextual disadvantage should affect everyone operating within that context; therefore, we

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would expect a direct, significant positive association between school disadvantage and dating violence victimization for both male and female adolescents.

In contrast, relative deprivation theory emphasizes how contextual disadvantage moderates the association between family disadvantage and the outcome studied. According to this perspective, deprivation is something that is individually perceived, and is constructed through a process of social comparison with a salient frame of reference (Webber, 2007). For adolescents, one frame of reference is their school environment. Applying this theory to dating violence, we would expect adolescents who are more deprived relative to their same-school peers to be at higher risk for dating violence victimization; further, this association should not vary by gender.

Finally, as opposed to both the above theories, gendered resource theories from the domestic violence literature predict that there should be gender differences in the effects of relative socioeconomic disadvantage (Anderson, 1997; Atkinson, et al., 2005). That is, in general we expect relative disadvantage to be more strongly related to female than male victimization. Such a prediction is based upon two premises. First, partnerships tend to be homogamous along sociodemographic characteristics (Blackwell & Lichter, 2000; Ford, Sohn, & Lepkowski, 2002); therefore females who are relatively disadvantaged will likely be paired with males who are also relatively disadvantaged. Second, relative socioeconomic disadvantage is more threatening to traditional masculine versus feminine gender roles (Anderson, 1997; Atkinson, et al., 2005); therefore relative socioeconomic disadvantage should spur violence as a means to reassert power more often by males than females.

## Methods

*Data*

This analysis utilized data from the National Longitudinal Study of Adolescent Health's (Add Health) contractual data set (Udry, 2003). Add Health is a prospective cohort study of a

nationally-representative sample of young persons enrolled in grades 7-12 in the 1994-95 school year (Wave I) (Harris, et al., 2003). Respondents were followed up one year after baseline (1996, Wave II). Add Health utilized a multistage probability sampling design to obtain its original Wave I sample. The first stage of sampling was a stratified, random sample of all public and private high schools in the U.S. A feeder school was also recruited from each participating community. In-school surveys were attempted with all students attending participating schools. In the second sampling stage, a sample of adolescents was drawn for in-depth in-home interviews, consisting of a core sample plus selected special oversamples. The parent (mother prioritized) or primary caretaker of adolescents who participated in Wave I in-home interviews was also recruited for an in-home interview. Persons who completed Wave I in-home interviews were eligible to participate at Wave II, with a few exceptions (e.g., respondents who were high school seniors at Wave I and were not part of a genetic pair or the disabled sample).

*Measures*

Outcome. Adolescent dating violence victimization was based on five items from the Conflict Tactics Scale 2 (CTS2) (Straus, Hamby, Boney-McCoy, & Sugarman, 1996) that were included in the Wave II in-home questionnaire; in some cases, item wording was slightly modified. For each of up to six romantic and/or sexual relationships reported, respondents were asked whether during the relationship their partner had ever done any of the following acts (yes or no): (1) "call you names, insult you, or treat you disrespectfully in front of others?" (2) "swear at you?" (3) "threaten you with violence?" (4) "push or shove you?" and/or (5) "thrown something at you that could hurt you?" A nominal summary variable with three mutually-exclusive categories was constructed: no victimization (no acts reported in any relationship or no relationships reported), psychological victimization (any of acts 1-3 reported and none of acts 4-5), and physical victimization (any of acts 4-5 reported, regardless of response to acts 1-3). This categorization is consistent with past studies (Halpern, et al., 2001; Halpern, Young, Waller,

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Martin, & Kupper, 2004) and is based on very few respondents reporting physical without psychological victimization.

Predictors. The first predictor variable under investigation, *individual/family disadvantage,* was constructed using a number of indicators for family socioeconomic status. Variables were chosen to be consistent with past studies studying social disorganization, and included: not living with both biologic parents (yes/no), family receives public assistance (yes/no), parent reports difficulty paying the bills (yes/no), highest parent education less than high school (yes/no), and having an unemployed parent (defined as not currently working for pay and seeking paid employment, yes/no) (Browning, 2002; Cunradi, et al., 2000; De Coster, Heimer, & Wittrock, 2006; Wight, et al., 2006). We applied polychoric principal components analysis, and used factor loadings on the first principal component as item weights in generating the summary score.

The second predictor variable under investigation, *school disadvantage*, was constructed by calculating the school-level prevalence of each characteristic included in the family disadvantage score; items demonstrated a good internal reliability (Cronbach's $\alpha = 0.82$). Because some groups were oversampled, and weights for selection probability within schools are not available, the school aggregate variable was based on respondents selected as part of the Add Health core sample. After standardizing all variables (mean = 0, standard deviation = 1), a principal component analysis was run (eigenvalues presented in Table 2). Factor loadings on the first principal component were used as item weights in generating the summary score.

Controls. A number of demographic covariates were included for individual-level dating violence victimization risk factors that may also be related to selection into schools characterized by concentrated disadvantage. These variables were derived from adolescent self-report at Wave II interview. *Demographic* control variables were age (group mean centered) and race/ethnicity (Non-Hispanic White, Non-Hispanic Black, Hispanic, Other). *Gender* was treated as a potential effect modifier, and all analyses were conducted stratified by gender. Indicators for other

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individual adolescent problem behaviors and mental health were not included, as they may either be mediators of the context-victimization relationship, or they may be effects of victimization itself. One *school-level control* variable was also included – mean age within the school (grand mean centered).

*Analytic Sample*

We utilized a number of analytic sample inclusion criteria. The base number of persons who participated in both Waves I and II and who had valid sampling weights available was 13,568. Respondents who did not report exclusively heterosexual relationships at Wave II were excluded (n=269) because past research has found risk factors for partner violence to vary across opposite-sex and same-sex couples (Halpern, et al., 2001; Halpern, et al., 2004). Also, respondents whose parents were not interviewed (n=1,924) or who were missing data on any of the individual-level covariates (n=755) were excluded. The resulting analytic sample size was 10,620. Respondents who reported no romantic or sexual relationships at Wave II (n=3,257) were included, as one strategy adolescents may use to avoid partner violence is to abstain from such relationships.

*Analyses*

All analyses were performed in Stata version 9 (StataCorp LP, College Station, Texas). Individual-level analyses were run with corrections for complex survey design and weighted to yield nationally-representative estimates. Multilevel multinomial logistic regression analyses with random effects were conducted using GLLAMM commands and included weights for both individuals and schools (Rabe-Hesketh & Skrondal, 2006; Rabe-Hesketh, Skrondal, & Pickles, 2004). The estimation procedure used was numerical integration (10 integration points) with adaptive quadrature (Rabe-Hesketh, et al., 2004). At Level-1, age was group mean centered, and race/ethnicity was entered as three dummy variables (non-Hispanic white as referent). Individual disadvantage was left on its original continuous scale, centered at the grand mean. Level-2 variables (mean age in school and concentrated disadvantage) were grand mean-centered. Level-

2 variables were left on their original continuous scale because a visual examination of bivariate

scatterplots (i.e., each level-two variable against school prevalence of victimization) indicated no

curvilinear or threshold relationships.

Analyses began by examining univariate distributions and bivariate relationships.

Proportions and means of partner violence victimization, individual-level confounders, and

school-level variables were calculated. The bivariate relationship between each covariate and the

dating violence victimization outcomes was assessed with a series of bivariate multilevel

multinomial logistic regression models with random intercepts.

For subsequent multivariable analyses, the final full model was:

<u>Level 1 model</u>: $\quad \eta_{ijk} = \beta_{0jk} + \beta_{1jk} (\text{FD}_{ij}) + \sum_{p=2}^{P} \beta_{pjk} X_{pij}$

<u>Level 2 model</u>: $\quad \beta_{0jk} = \gamma_{00k} + \gamma_{01k} (\text{AGE}_j) + \gamma_{02k} (\text{SD}_j) + u_{0j}$

$$\beta_{1jk} = \gamma_{10k} + \gamma_{11k} (\text{SD}_j) + u_{1j}$$

$$\beta_{pjk} = \gamma_{p0k} \quad (\text{for } p > 1)$$

$$\begin{bmatrix} u_{oj} \\ u_{1j} \end{bmatrix} \sim \text{N} \left( \begin{bmatrix} 0 \\ 0 \end{bmatrix}, \begin{bmatrix} \tau_{00} \\ \tau_{01} \tau_{11} \end{bmatrix} \right)$$

Where $i$ indexes individuals within schools, $j$ is an index for schools, $p$ is an index for individual-

level covariates, and $k$ indexes the outcome (psychological or physical victimization). The

predicted log odds of dating violence victimization ($\eta$) is modeled as a function of the school

mean log odds of victimization ($\beta_{0jk}$), family disadvantage (FD$_{ij}$), and the vector of individual-

level covariates (X$_{pij}$), which were the same for both physical and psychological victimization; all

covariates except family disadvantage were entered as individual-level fixed effects. We model

the school mean log odds of victimization ($\beta_{0jk}$) as a function of the grand mean of the log odds

of victimization ($\gamma_{00k}$), school mean age (AGE$_j$), school disadvantage (SD$_j$), and the random

effect for school $j$ ($u_{0j}$). The slope for individual disadvantage $\beta_{1jk}$ is modeled as a function of

the grand mean of these slopes ($\gamma_{10k}$), school disadvantage (SD$_j$), and the random effect for

school $j$ ($u_{1j}$). We assume that the random effects for both the intercept and slope are normally

distributed with means of zero, variance of $\tau_{00}$ for the intercept and $\tau_{11}$ for the slope, and a

covariance between the intercept and slope of $\tau_{10}$.

A number of models were fit separately for female and male participants. First, to assess

the level of variability in gender-specific dating violence victimization across schools, an

intercept-only model with random intercepts was run to calculate the intraclass correlation

coefficient (ICC). The level-1 variance was assumed equal to be that of a logistic distribution

($\pi^2/3$) (Raudenbush & Bryk, 2002), and the ICC was calculated as ($\tau_{00}$)/($\tau_{00}$+[$\pi^2/3$]). We did

not conduct significance testing for random effect variance estimates, because likelihood ratio

tests are invalid with weighted data (Sribney, 2005), and Wald chi-square tests can be overly

conservative when testing against the parameter boundary value (zero) (Fitzmaurice, Laird, &

Ware, 2004). Instead, we examined the magnitude and relative precision of the variance

estimates. In the second model, we tested the relationship between family disadvantage and

dating violence victimization net of control variables by adding level-1 fixed effects for all

individual-level variables, as well as the school mean age variable. In the third model, we

examined the direct influence of school disadvantage over and above family disadvantage by

adding the school disadvantage score. We assessed the influence of school disadvantage both by

examining the magnitude and statistical significance of the regression coefficient, as well as by

examining the relative change in unexplained intercept variance. In the final model, we assessed

whether the influence of family disadvantage on dating violence victimization varied by school

disadvantage by adding a random slope for family socioeconomic disadvantage, as well as a

cross-level interaction between family and school disadvantage. All individual-level variables

were maintained in multivariable models because of the theoretical need to control for factors related to selection into schools.

## Results

*Descriptive Results*

Descriptive statistics for the sample students are presented in Table 1. The majority of respondents reported non-Hispanic white race/ethnicity (71.1% each, females and males). Mean scores for family disadvantage were -0.60 for females and -0.64 for males, and mean age was 16.3 years for females and 16.5 years for males. Overall, among female respondents, 13.9% reported psychological victimization and 8.1% reported physical victimization by at least one romantic or sexual partner in the 18 months prior to Wave II interview; among male respondents, 13.6% reported psychological and 7.2% reported minor physical victimization in the same time period. Information regarding schools' characteristics is presented in Table 2. The mean gender-specific school prevalences of dating violence victimization were slightly different from the corresponding overall population-weighted prevalences (females 18.7% psychological, 8.7% minor physical; males 18.2% psychological, 7.6% minor physical). Concentrated disadvantage scores across schools were distributed approximately normally (mean=0, standard deviation [SD]=1), with some right-skewness.

*Bivariate Results*

Results from bivariate multilevel multinomial logistic regression models are presented in Table 3. Gender differences were observed in patterns of associations. Relative age within school and school mean age were significantly positively related to psychological and physical victimization among both female and male participants. Race/ethnicity was significantly related to victimization only among males: non-Hispanic black, Hispanic, and non-Hispanic other males evidenced higher odds of physical victimization compared to non-Hispanic white males. Although family disadvantage was positively associated with females' physical victimization and

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males' psychological and physical victimization, school-level disadvantage was positively related only to males' physical victimization.

*Multivariable Results*

Females.  Multivariable results for females are presented in Table 4.  The first model, an intercept-only model, suggests proportionately small but important variation across schools in female dating violence victimization.  The ICC indicates that about 5% of the variability in dating violence victimization is due to differences between school contexts.  After addition of individual-level covariates and school mean age in the second model, about 36% of the between-school variation in the odds of female dating violence victimization is explained.  Notably, family disadvantage remains significantly positively associated with females' physical victimization after controlling for age and race/ethnicity.  In model three, school disadvantage was added and remained unrelated to females' victimization; unexplained between-school variability in dating violence victimization remained unchanged after adding school disadvantage.  In model four, a cross-level interaction between family and school disadvantage was found to be highly significant.  At the average level of school disadvantage (i.e., where the interaction term would be equal to zero), family disadvantage was found to be significantly related to an increased odds of both psychological and physical victimization among females. Further, family disadvantage was more strongly related to females' victimization in more advantaged schools (Figures 1 and 2). Variability by school disadvantage appeared stronger for psychological compared to physical victimization.  As one example, the predicted probability of psychological victimization for a non-Hispanic white, average-aged female, with a family disadvantage score one standard deviation above average is 11% *lower* in a school one standard deviation above versus one standard deviation below the school disadvantage mean.

Males.  Multivariable results for males are presented in Table 5.  The intercept-only model suggests that males' victimization is more related to differences between school contexts than for females.  The ICC indicates that about 10% of the variability in dating violence

victimization is due to differences between school contexts. After addition of individual-level covariates and school mean age in the second model, about 38% of the between-school variation in the odds of male dating violence victimization is explained. Notably, the modest associations between family disadvantage and males' victimization found in crude models is reduced and no longer significant in the adjusted model (psychological victimization OR=1.20, AOR=1.14; physical victimization OR=1.33, AOR=1.13); however, nonwhite race/ethnicity remains significantly positively related to males' physical victimization. In model three, school disadvantage was added and was found to be unrelated to males' victimization after adjusting for other individual characteristics and school mean age. In model four, a cross-level interaction between family and school disadvantage was found to be small in magnitude and nonsignificant, suggesting that the association between family disadvantage and males' dating violence does not vary substantially by school disadvantage levels.

## Discussion

Although prior research documents a disproportionate burden of partner violence among adult couples with lower socioeconomic status, findings relating family socioeconomic disadvantage to adolescent dating violence have been inconsistent. Despite evidence in the adult partner violence literature on the role of status incongruity in partner violence, and evidence relating relative deprivation to other adolescent health indicators, little is known about how family and contextual disadvantage interact to affect adolescent dating violence. We address these gaps in the current study.

Between-school variability in dating violence victimization, even if proportionately small compared to within-school variability, is substantial for both males and females. The intraclass correlations should be considered in the context of other studies of adolescent risk behavior (e.g., alcohol and cigarette use) that, on average, find school-level intraclass correlations between 0.01 and 0.03 (Murray & Short, 1997; Smolkowski, Biglan, Dent, & Seeley, 2006). Even after

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adjusting for family-level disadvantage, age, and race/ethnicity, ICCs remain at 0.04 for girls and 0.06 for boys. Differences with prior studies could reflect that dating violence is more variable than other risk behaviors across school contexts; however, they also could reflect different individual-level control variables utilized across analyses.

The predictions of social disorganization theory – that victimization should be greater in contexts with high socioeconomic disadvantage – were not supported at all among female respondents and were supported among male respondents only prior to adjustment for family socioeconomic disadvantage. These findings agree with those of Foshee et al. (2008), who did not find associations between contextual disadvantage and dating violence perpetration even in crude analyses (Foshee, Karriker-Jaffe, et al., 2008). However, our findings diverge from those of Cunradi et al., who found neighborhood poverty was positively associated with adult male victimization amongst Blacks and Whites, as well as female victimization among Blacks (Cunradi, et al., 2000). The contrast between the two studies of adolescent dating violence and the one study of adult partner violence could suggest contextual disadvantage plays a larger role in adult versus adolescent partner violence. However, differences may also arise because the adolescent studies used an index of disadvantage, while the adult study used a single indicator of neighborhood poverty. Our choice to use the disadvantage index was based on our application of social disorganization theory (Browning, 2002; Sampson, et al., 1997). It is possible that using the index masks important associations between singular indicators of contextual disadvantage and dating violence. However, it is also possible that using a single indicator of area disadvantage results in spurious associations. Future dating violence research should examine the relevance and validity of single indicators versus indices of disadvantage.

Findings that relative disadvantage was associated only with female victimization is consistent with the general contentions of gendered resource theory. Family disadvantage was positively related to females' dating violence victimization, and this relationship was stronger in schools that were better off socioeconomically (i.e., less disadvantaged). This finding extends

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prior studies which found associations between adult females' victimization risk and male relative disadvantage in the couple context (Anderson, 1997; Atkinson, et al., 2005; Hornung, et al., 1981), by linking females' odds of dating violence victimization to relative disadvantage within the school context. It is possible that being in a position of relative socioeconomic disadvantage may negatively affect females' self-esteem (Rhodes, et al., 2004), which could increase vulnerability to victimization (Pflieger & Vazsonyi, 2006). It is also possible that, assuming some socioeconomic homogamy in dating relationships (Blackwell & Lichter, 2000; Ford, et al., 2002), females' relative disadvantage could reflect male partners' relative disadvantage, and that the male partner's relative disadvantage impacts his likelihood of perpetrating dating violence. Assuming socioeconomic disadvantage is more threatening to masculine than feminine identities, it is possible that male partners, when in a socioeconomically disadvantaged position relative to same-school peers, feel disempowered, and use violence against female partners as a way of exerting power or gaining status. Gender differences in the salience of relative socioeconomic disadvantage may also explain why relative deprivation is unrelated to males' victimization (i.e., female perpetration). Future studies utilizing data on relative deprivation for both adolescent dating partners, as well as information on both partners' perpetration of dating violence, may help explain this mechanism.

Although this study has many strengths, including the use of a large nationally-representative data set with adolescents from many community types, its limitations must also be noted. First, because questions at Wave II queried only victimization, we were unable to assess how family and school disadvantage related to dating violence perpetration. Although studies of perpetration have been undertaken using local samples, such studies have not examined interactions between family and contextual disadvantage. Future studies should address this gap.

Second, because we use act-specific questions about dating violence, we are unable to characterize the context or intention behind the act. Qualitative studies of adolescent dating violence, similar to studies of adult partner violence, suggest there is heterogeneity in the

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circumstances of and meanings ascribed to adolescent dating violence experiences (Foshee, Bauman, Linder, Rice, & Wilcher, 2007). It is possible family and school disadvantage have differential effects on these subtypes. Future studies should examine whether family and school disadvantage are differentially related to dating violence subtypes.

Third, the calculation of between-school variability in the present study is based on an assumed level-1 variance equal to that of a logistic distribution. Although this is standard practice in multilevel studies with discrete outcomes – because level-1 variance is unknown – there is no way to test the appropriateness of this assumption. If actual within-school variability in risk for dating violence victimization is less than the variance in a logistic distribution, the ICC calculated in the present study will be underestimated.

Finally, we had to exclude a sizeable number of respondents because of their parents' non-participation in the parent interview. Adolescents who were included evidenced some positive selection on socioeconomic characteristics, based on adolescent responses to questions about parent education and family structure. As such, some level of selection bias could affect the estimates in the present study. Given the complexity of our models, we were unable to also apply Heckman adjustments (Heckman, 1979) to investigate these selection biases. Future replication studies with other datasets and populations should be conducted to test the robustness of our findings.

*Conclusion*

In the present study, we found evidence that dating violence varies appreciably across school contexts. For males, crude associations between family and school disadvantage were explained by other individual-level factors, including relative age and race/ethnicity; further, associations between family disadvantage and victimization did not vary by school disadvantage level. In contrast, for females, school disadvantage was not directly associated with victimization in either crude or adjusted analyses; however, family disadvantage was associated with increased odds of both psychological and physical victimization, particularly in socioeconomically

advantaged schools. Such findings support the notions that relative status in the school affects

dating violence and that girls are more vulnerable to this status differential than boys when it

comes to dating violence victimization. Relative disadvantage may affect girls' vulnerability

through effects on self-esteem; however, it also may reflect male partners' attempts to reassert

masculinity due to their own relative disadvantage in the school context. Future studies should

examine potential mediating mechanisms, as well as other sources of status differences that could

affect vulnerability to dating violence. Results underline the importance of examining how

contexts influence and moderate individual risks for partner violence. They also suggest dating

violence interventions should consider how gender and sociostructural conditions shape risk for

dating violence.

**Table 1. Descriptive statistics: Individual characteristics**

|  | Females n=5,434 n (weighted %) | Males n=5,186 n (weighted %) |
|---|---|---|
| Partner violence victimization |  |  |
| None | 4,258 (78.1%) | 4,028 (79.3%) |
| Psychological only | 747 (13.9%) | 779 (13.6%) |
| Physical | 429 (8.1%) | 379 (7.2%) |
| Race/ethnicity |  |  |
| Non-Hispanic White | 3,150 (71.1%) | 3,023 (71.1%) |
| Non-Hispanic Black | 1,128 (14.3%) | 975 (13.5%) |
| Hispanic | 848 (11.3%) | 841 (11.1%) |
| Non-Hispanic Other | 308 (3.3%) | 347 (4.3%) |
| Family disadvantage, mean (SE) | -0.60 (0.03) | -0.64 (0.03) |
| Age, mean (SE) | 16.3 (0.11) | 16.5 (0.12) |

**Table 2. Descriptive statistics: School characteristics (n=132)**

|  | Mean (SD) | Range | Factor Loading |
|---|---|---|---|
| **Count of eligible respondents per school** |  |  |  |
| Female respondents | 41.5 (38.9) | 5 - 377 | -- |
| Male respondents | 39.3 (40.8) | 3 - 378 |  |
| **Dating violence victimization prevalence** |  |  |  |
| Female respondents |  |  |  |
| Psychological victimization | 18.7 (8.4) | 0 – 41.4 | -- |
| Minor physical victimization | 8.7 (5.2) | 0 – 21.4 | -- |
| Male respondents |  |  |  |
| Psychological victimization | 18.2 (9.6) | 0 – 44.4 | -- |
| Minor physical victimization | 7.6 (5.6) | 0 – 32.3 | -- |
| **School disadvantage indicators** |  |  |  |
| % students not living with two biologic parents | 46.6 (13.7) | 10.5 – 81.3 | 0.75 |
| % with unemployed parents | 5.6 (4.4) | 0 – 23.6 | 0.72 |
| % students in families receiving public assistance | 15.0 (13.8) | 0 – 55.8 | 0.93 |
| % parents have difficulty paying bills | 18.3 (9.9) | 0 – 50.0 | 0.73 |
| % students with highest parental education <HS | 12.8 (12.0) | 0 – 65.8 | 0.76 |
| *School disadvantage score*[a] | *0 (1)* | *-1.68 – 2.76* | -- |

[a]Cronbach's α = 0.82; eigenvalues 3.08, 0.70, 0.60, 0.43, 0.18

**Table 3. Bivariate model results: Analytic variables and dating violence victimization[a]**

| | Female Victimization (n=5,434) | Male Victimization (n=5,186) |
|---|---|---|
| | OR (95% CI) | OR (95% CI) |
| **Psychological Vs. None** | | |
| *Individual-level characteristics* | | |
| Family disadvantage | 1.07 (0.95 – 1.20) | 1.20 (1.03 – 1.40)* |
| Race/ethnicity | | |
|    Non-Hispanic White | Referent | Referent |
|    Non-Hispanic Black | 0.75 (0.52 – 1.08) | 1.33 (0.96 – 1.84) |
|    Hispanic | 0.73 (0.51 – 1.04) | 1.04 (0.71 – 1.51) |
|    Non-Hispanic Other | 0.82 (0.49 – 1.39) | 0.84 (0.48 – 1.46) |
| Age (group centered) | 1.16 (1.04 – 1.29)** | 1.43 (1.27 – 1.61)*** |
| *School-level characteristics* | | |
| School disadvantage | 0.95 (0.82 – 1.11) | 1.01 (0.86 – 1.19) |
| School mean age | 1.26 (1.11 – 1.44)*** | 1.39 (1.23 – 1.56)*** |
| **Physical Vs. None** | | |
| *Individual-level characteristics* | | |
| Family disadvantage | 1.20 (1.03 – 1.41)* | 1.33 (1.14 – 1.56)*** |
| Race/ethnicity | | |
|    Non-Hispanic White | Referent | Referent |
|    Non-Hispanic Black | 1.07 (0.77 – 1.48) | 2.67 (1.76 – 4.05)*** |
|    Hispanic | 0.77 (0.57 – 1.05) | 2.03 (1.32 – 3.13)** |
|    Non-Hispanic Other | 0.74 (0.33 – 1.66) | 1.94 (0.98 – 3.85)[†] |
| Age (group centered) | 1.16 (1.01 – 1.34)* | 1.23 (1.06 – 1.43)** |
| *School-level characteristics* | | |
| School disadvantage | 1.06 (0.91 – 1.23) | 1.27 (1.07 – 1.51)** |
| School mean age | 1.27 (1.13 – 1.42)*** | 1.38 (1.17 – 1.61)*** |

[†] p<0.10   *p<0.05   **p<0.01   ***p<0.001

[a]A separate random intercept model was run for each covariate

**Table 4. Multilevel multinomial logistic regression results: Dating violence victimization, Females (n=5,434)**

| | EST. B(SE) | | | |
| --- | --- | --- | --- | --- |
| | **Model 1** | **Model 2** | **Model 3** | **Model 4** |
| **Psychological vs. None** | | | | |
| *Individual-level variables* | | | | |
| Family disadvantage | | 0.10 (0.06) | 0.10 (0.07) | 0.17 (0.07)* |
| Race/ethnicity | | | | |
| Non-Hispanic White | | Ref. | Ref. | Ref. |
| Non-Hispanic Black | | -0.34 (0.19)[†] | -0.34 (0.21) | -0.33 (0.20) |
| Hispanic | | -0.37 (0.18)* | -0.37 (0.19)[†] | -0.38 (0.19)* |
| Non-Hispanic Other | | -0.23 (0.26) | -0.23 (0.27) | -0.28 (0.27) |
| Age | | 0.16 (0.06)** | 0.16 (0.06)** | 0.16 (0.06)** |
| *School-level variables* | | | | |
| School mean age | | 0.24 (0.07)*** | 0.24 (0.07)*** | 0.25 (0.07)*** |
| School disadvantage | | | -0.01 (0.09) | -0.11 (0.10) |
| *Cross-level interaction* | | | | |
| Family disadvantage * School disadvantage | | | | -0.24 (0.06)*** |
| Intercept | -1.78 (0.08)*** | -1.64 (0.09)*** | -1.64 (0.09)*** | -1.54 (0.10)*** |

## Physical vs. None

| | | | | |
|---|---|---|---|---|
| *Individual-level variables* | | | | |
| Family disadvantage | | 0.19 (0.08)* | 0.18 (0.08)* | 0.23 (0.09)* |
| Race/ethnicity | | | | |
| Non-Hispanic White | | Ref. | Ref. | Ref. |
| Non-Hispanic Black | | -0.04 (0.16) | -0.08 (0.17) | -0.07 (0.17) |
| Hispanic | | -0.37 (0.16)* | -0.41 (0.17)* | -0.43 (0.17)* |
| Non-Hispanic Other | | -0.36 (0.42) | -0.38 (0.43) | -0.41 (0.42) |
| Age | | 0.15 (0.07)* | 0.15 (0.07)* | 0.16 (0.07)* |
| *School-level variables* | | | | |
| School mean age | | 0.24 (0.06)*** | 0.24 (0.06)*** | 0.25 (0.06)*** |
| School disadvantage | | | 0.06 (0.09) | -0.01 (0.09) |
| *Cross-level interaction* | | | | |
| Family disadvantage * School disadvantage | | | | -0.16 (0.09)[†] |
| Intercept | -2.36 (0.08)*** | -2.22 (0.10)*** | -2.22 (0.11)*** | -2.13 (0.11)*** |

## Variance Estimate

| | | | | |
|---|---|---|---|---|
| Intercept | 0.19 (0.05) | 0.12 (0.04) | 0.12 (0.04) | 0.13 (0.06) |
| Family disadvantage | | | | 0.002 (0.006) |

| Statistics | | | | |
| --- | --- | --- | --- | --- |
| Intraclass correlation (ICC)[a] | 0.05 | 0.04 | 0.04 | 0.04 |
| % change in intercept variance[b] | -- | -35.55% | -35.55% | -30.38% |

[†] p<0.10   *p<0.05   **p<0.01   ***p<0.001

[a] Based on a level-1 logistic distribution with variance $\Pi^2/3$

[b] Compared to intercept-only model

**Figure 1. Females: Predicted probability of psychological victimization by family and school disadvantage levels[a]**
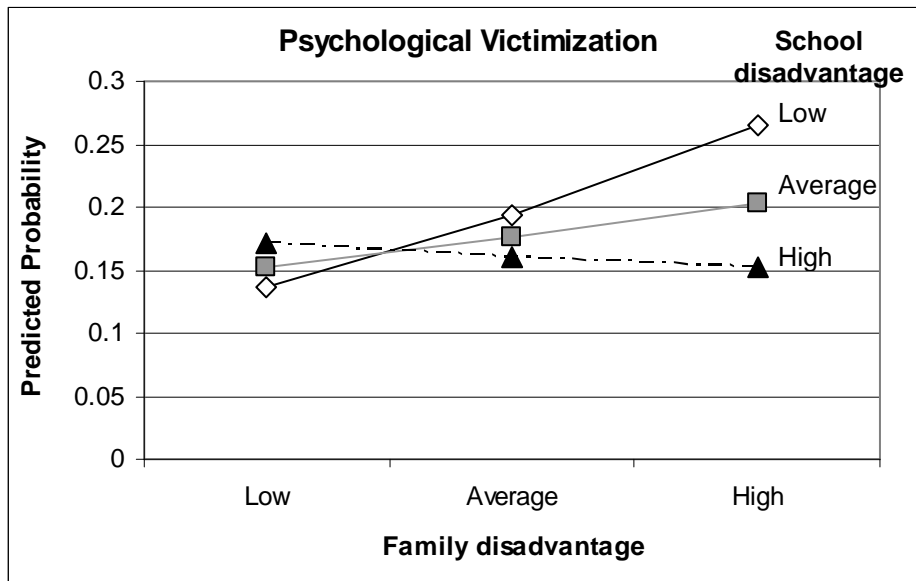


[a] Predicted probabilities for a non-Hispanic white female who is average age within the school; high disadvantage is one standard deviation above average, and low disadvantage is one standard deviation below average.

**Figure 2. Females: Predicted probability of physical victimization by family and school disadvantage levels[a]**
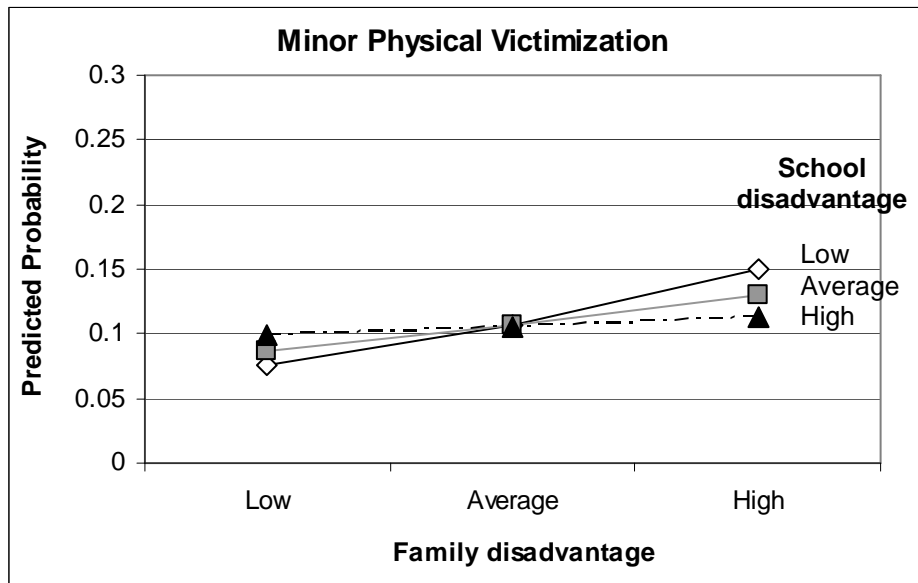


[a] Predicted probabilities for a non-Hispanic white female who is average age within the school; high disadvantage is one standard deviation above average, and low disadvantage is one standard deviation below average.

**Table 5. Multilevel multinomial logistic regression results: Dating violence victimization, Males (n=5,186)**

| | | Est. β(SE) | | |
| --- | --- | --- | --- | --- |
| | **Model 1** | **Model 2** | **Model 3** | **Model 4** |
| **Psychological vs. None** | | | | |
| *Individual-level variables* | | | | |
| Family disadvantage | | 0.13 (0.09) | 0.15 (0.09) | 0.16 (0.10) |
| Race/ethnicity | | | | |
|   Non-Hispanic White | | Ref. | Ref. | Ref. |
|   Non-Hispanic Black | | 0.23 (0.17) | 0.26 (0.18) | 0.29 (0.19) |
|   Hispanic | | -0.07 (0.19) | -0.03 (0.21) | -0.03 (0.20) |
|   Non-Hispanic Other | | -0.12 (0.27) | -0.10 (0.27) | -0.12 (0.27) |
| Age | | 0.35 (0.06)*** | 0.35 (0.06)*** | 0.35 (0.06) |
| *School-level variables* | | | | |
| School mean age | | 0.35 (0.06)*** | 0.35 (0.06)*** | 0.35 (0.06)*** |
| School disadvantage | | | -0.05 (0.09) | -0.09 (0.10) |
| *Cross-level interaction* | | | | |
| Family disadvantage * School disadvantage | | | | -0.08 (0.09) |
| Intercept | -1.79 (0.09)*** | -1.84 (0.13)*** | -1.85 (0.13)*** | -1.82 (0.14)*** |

| **Physical vs. None** | | | | |
|---|---|---|---|---|
| *Individual-level variables* | | | | |
| Family disadvantage | | 0.12 (0.10) | 0.10 (0.10) | 0.08 (0.12) |
| Race/ethnicity | | | | |
| Non-Hispanic White | | Ref. | Ref. | Ref. |
| Non-Hispanic Black | | 0.93 (0.23)*** | 0.89 (0.25)*** | 0.91 (0.26)** |
| Hispanic | | 0.62 (0.25)* | 0.58 (0.27)* | 0.60 (0.27)* |
| Non-Hispanic Other | | 0.72 (0.34)* | 0.70 (0.34)* | 0.69 (0.35)* |
| Age | | 0.20 (0.08)** | 0.20 (0.07)** | 0.20 (0.08)** |
| *School-level variables* | | | | |
| School mean age | | 0.33 (0.08)*** | 0.33 (0.08)*** | 0.33 (0.08)*** |
| School disadvantage | | | 0.04 (0.10) | 0.04 (0.10) |
| *Cross-level interaction* | | | | |
| Family disadvantage * School disadvantage | | | | 0.02 (0.09) |
| Intercept | -2.46 (0.09)*** | -2.81 (0.17)*** | -2.80 (0.17)*** | -2.84 (0.20)*** |
| **Variance Estimates** | | | | |
| Intercept | 0.35 (0.07) | 0.21 (0.05) | 0.21 (0.05) | 0.22 (0.06) |
| Family disadvantage | | | | 0.06 (0.05) |

| Statistics | | | | |
|---|---|---|---|---|
| Intraclass correlation (ICC)[a] | 0.10 | 0.06 | 0.06 | 0.06 |
| % change in intercept variance[b] | -- | -37.60% | -37.60% | -34.81% |

$^\dagger$ p<0.10   *p<0.05   **p<0.01   ***p<0.001

[a] Based on a level-1 logistic distribution with variance $\Pi^2/3$

[b] Compared to intercept-only model

**CHAPTER 3: Area Disadvantage and Intimate Partner Homicide: An Ecological Analysis of North Carolina Counties, 2004-2005**

**Introduction**

Intimate partner violence (IPV) is defined as violence or threat of violence in a close relationship, including current or former spouses and dating partners (National Center for Injury Prevention and Control, 2006). Data from the 1995 National Violence Against Women Survey estimated women age 18 and older experience 4.8 million intimate partner assaults annually, while adult men experience 2.9 million such assaults (Tjaden & Thoennes, 2000). The CDC estimated that the costs of IPV against women in 1995 exceeded $5.8 billion, including nearly $4.1 billion in the direct costs of medical and mental health care and nearly $1.8 billion in the indirect costs of lost productivity (National Center for Injury Prevention and Control, 2003). Although no similar total cost estimates are available for male victims, another study found the average per-person cost of physical victimization for women was more than twice the cost of physical victimization for men (Arias & Corso, 2005). Given the prevalence and associated costs, intimate partner violence has been recognized as a major public health problem.

The most severe consequence of intimate partner violence is intimate partner homicide. From 1976 to 2005, about 11% of homicide victims were killed by an intimate partner (Fox & Zawitz, 2004). In 2005, 329 males and 1,181 females in the U.S. were killed by an intimate partner (Fox & Zawitz, 2007). There was a decrease in the number and rates of intimate partner homicides between 1976 and 2005; this decrease was greater for males than for females (Catalano, 2006; Puzone, et al., 2000). Rates of intimate partner homicide also declined in the last two decades for most partner types. Using data from the FBI's Supplemental Homicide

Report data file, Puzone et al. (2000) found that between 1976 and 1995, the rate of homicide per 100,000 population declined significantly for wives (1.79 to 1.05), husbands (1.61 to 0.40), and boyfriends (1.55 to 0.50) but not for girlfriends (1.34 to 1.06) (Puzone, et al., 2000).

There are many recognized risk factors for intimate partner homicide, including prior domestic violence, access to guns, estrangement or relationship breakup, having stepchildren, alcohol abuse, prior forced sex, threats to kill, and nonfatal strangulation (Campbell, Glass, Sharps, Laughon, & Bloom, 2007). Intimate partner homicide also has been related to contextual disadvantage (i.e., spatial concentration of socioeconomic disadvantage), but inconsistently across studies. Examining data from female-victim intimate partner homicides in Chicago between 1965-1995, Browning (2002) found neighborhood concentrated disadvantage was positively associated with such homicide rates (Browning, 2002). In another study using data from a large city, Frye and Wilt (2001) analyzed medical examiner data on female homicides in New York City between 1990 and 1997, finding that neighborhood SES was negatively associated with intimate partner femicide rates (Frye & Wilt, 2001). Grana (2001) compared rates of domestic femicide across 32 states. The author found that in unadjusted analyses, the state poverty rate was significantly positively associated with the state's domestic femicide rate (Grana, 2001). However, after controlling for the proportion of the population that was Black, the proportion of young persons in the population, and south/nonsouth state location, the point estimate became nonsignificant. It is unclear how to interpret such findings, however, because adjustment for these factors had only a small effect on the magnitude of the point estimate itself, although precision decreased so that one could no longer be confident that the estimate was different from zero. Additionally, a theoretical explanation for adjusting for the percentage of the population which was Black was lacking.

Although these studies provide some information regarding the relationship between concentrated disadvantage and intimate partner homicide, a number of gaps in research remain. First, all noted studies focused on intimate partner femicide and did not explore how concentrated

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disadvantage may be related to females' killing their male partners.  Given findings indicating couple-level economic status may be more closely related to male partner murder (Dugan, et al., 1999), the relationship between concentrated disadvantage and female-perpetrated partner homicide should be explored further.  Second, two of the three studies cited focused on large cities, while the other examined differences between states.  Although one study found concentrated disadvantage to be related to general violent crime in non-metropolitan counties (Bouffard & Muftic, 2006), how concentrated disadvantage is related to intimate partner homicide in non-urban counties has not yet been explored.  Because of differences between urban and rural communities in the use of informal versus formal social controls, population heterogeneity and density, as well as overall levels of extreme poverty (i.e., higher in rural compared to urban centers) (Bouffard & Muftic, 2006), the relationship between community characteristics and within-family crime may also differ.  Further, it is unclear whether the state-level analysis performed by Grana would capture the relationship between area disadvantage and intimate partner homicide because social disorganization theory (described in detail below) is premised on the concept of informal social controls exerted at the local level.

Intimate partner homicide is "commonly the culmination of ongoing violence in the relationship (p. 190)"(Dugan, et al., 1999). Further, the murder of a male by his female partner is most often precipitated by abuse instigated by the male (Dugan, et al., 1999). Therefore interventions targeting recognition of and intervention on abusive relationships have been the focus of most partner homicide prevention efforts.  Changes in criminal justice responses to partner violence incidents, as well as the increase in victims' services, are believed to be at least partially responsible for the dramatic decrease in partner violence rates since the mid-1970s (Dugan, et al., 1999; Dugan, et al., 2003).  However, such services, especially shelter services, are not equitably distributed across all communities.  Tiefenthaler, Farmer and Sambria (2005), for example, found that services for victims of intimate partner violence were much more likely to be located in counties which were affluent and housed a major university (Tiefenthaler, et al., 2005).

Therefore one mechanism by which community disadvantage may impact intimate partner homicide rates is through this differential distribution of preventive services.

This analysis will draw upon social disorganization theory in exploring how community contexts relate to intimate partner homicide. According to this theory, communities that are characterized by fewer material and structural resources are not as effective as those with more resources in regulating residents' behavior (Sampson, 1997; Sampson, et al., 1997). That is, because residents in these communities have less time and fewer resources to invest in their relationships with one another and in local social institutions, concentrated disadvantage is thought to affect neighbors' ability to build mutual good will and trust (Sampson, Morenoff, & Gannon-Rowley, 2002). This lack of social capital in turn affects the willingness and ability of residents to intervene when they observe unacceptable behavior, as well as residents' ability to collectively lobby social institutions and the larger society for needed resources (Taylor, 1997). Social disorganization theory, as a general theory of deviance, suggests that concentrated disadvantage should be positively associated with violent crimes (including intimate partner homicide) across communities, despite their relative urbanicity. Therefore, it is expected that the rates of partner homicide in North Carolina counties will be positively associated with county concentrated disadvantage regardless of county urbanicity. Further, it is expected that this association will be at least partially mediated by the availability of domestic violence shelter services in the county.

**Methods**

*Data*

Multiple data sources were utilized. First, data from the restricted use North Carolina Violent Death Reporting System (NC-VDRS) were employed. The NC-VDRS database is a repository for information on violent deaths (i.e., deaths involving "the intentional use of physical force or power against oneself, another person, or against a group or community") (Sanford, et

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al., 2006) collected by multiple NC government agencies, including the State Department of Health (death certificates), law enforcement (incident and investigatory reports), and the state medical examiner (autopsy reports).  Data include information on victims, suspected perpetrators, the manner of death, as well as the circumstances surrounding the death.  Trained abstracters identify eligible incidents by matching death certificates and medical examiner information using manner of death and ICD-10 codes selected by the National Violent Death Reporting System.  These abstracters then also review relevant records from the other NC database sources.  Data on violent deaths in North Carolina have been collected since January 1, 2004. Data regarding NC county population and sociodemographic characteristics were derived from the 2000 decennial Census.  Finally, data on North Carolina domestic violence services were provided by the North Carolina Council for Women / Domestic Violence Commission (NCCW). NCCW conducts an annual survey of state domestic violence programs in which agency directors provide information on types and counts of services provided during the prior year.  Additionally, the former director of NCCW, Leslie Starsoneck, provided county-level data on total funding for domestic violence services received from Federal and State funding streams, derived from a review of public databases and legislation (Starsoneck, 2008).

*Measures*

The main outcome variable, average annual county intimate partner homicide incidence rate, was derived based on deaths in NC-VDRS between 2004-2005 and inter-censal county population estimates for years 2004-2005 published by the Census Bureau.  An NC-VDRS death was defined as an intimate partner homicide if the victim-to-suspect relationship on the initial law enforcement response to incident report was coded as "1=Spouse or other intimate partner (current or ex)."  Other deaths that occurred in the same incident (e.g., child also killed, perpetrator commits suicide, witnesses killed) were not included.  The number of such deaths was summed within each North Carolina county and aggregated across the years to address the problem of small total numbers in some counties (e.g., there were 89 intimate partner violence

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homicides in all of North Carolina in 2005). County rates were derived by dividing the number of deaths identified between 2004-2005 by the sum of the 2004-2005 midyear county population estimates. Rates were calculated separately by gender.

The main <u>predictor variable</u>, county disadvantage, was derived from a number of variables available in the 2000 Census. Consistent with past studies of social disorganization, these variables included proportion of households below the poverty line, proportion of female-headed households, proportion of households receiving public assistance, proportion of individuals aged 25+ without a high school diploma, and unemployment rate (Browning, 2002; Cunradi, et al., 2000; De Coster, et al., 2006; Wight, et al., 2006). Racial/ethnic composition was not included because of the need to distinguish between economic and other sources of disadvantage (Massey, 1998). Principal components analysis was conducted at the county level to generate the county disadvantage score (i.e., loadings on the first principal component were used as item weights). Examination of factor scores and scree plots supported a single-factor solution.

One <u>moderator variable</u>, county urbanicity, was based on the United States Department of Agriculture (USDA) Urban-Rural Continuum Codes (United States Department of Agriculture, 2003). These codes form a classification scheme that distinguishes metropolitan (metro) counties by the population size of their metro area, and nonmetropolitan (nonmetro) counties by degree of urbanization and adjacency to a metro area or areas.[1] The metro and nonmetro categories have been subdivided into three metro and six nonmetro groupings, resulting in a nine-part county codification. The codes allow finer residential groupings beyond a simple metro-nonmetro dichotomy. Such codes have been used in other analyses of trends in intimate partner homicide over time (Gallup-Black, 2005). As in previous analyses of this question (Gallup-Black, 2005),

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[1] The Census Bureau defines an urbanized area wherever it finds an urban nucleus of 50,000 or more people. They may or may not contain any individual cities of 50,000 or more (152 currently do not). In general, they must have a core with a population density of 1,000 persons per square mile and may contain adjoining territory with at least 500 persons per square mile. Metro areas are defined for all urbanized areas regardless of total area population. In addition, inclusion as an outlying county is based on a single commuting threshold of 25 percent with no "metropolitan character" requirement.

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categories were combined (urban metropolitan, urban non-metropolitan, rural) based on few counties being in certain levels.

Mediator variables were constructed using the data from NCCW. These included (all at the county level): a dichotomous indicator for whether a domestic violence shelter was available in the county, per capita funding for domestic violence services (average across 2004-2006), number of days the shelter was full to capacity (2004-05), and number of referrals made to other shelters due to a shelter's being full (2004-05). The last two variables capture the extent to which demand for shelter services is greater than the available services. Variables were examined both in continuous as well as categorical formats (i.e., quartiles) to explore possible non-linear relationships with homicide rates.

A number of control variables were also included in the analysis. The percentage of the population between the ages of 20-40 years was included, since young adulthood is the life stage when the incidence of partner violence is at its highest (Greenfeld, et al., 1998). Also, county female-to-male sex ratio of persons age 15 and older was included. Sex ratio imbalances – in particular, having a shortage of "marriageable males" – have been associated with higher divorce rates, marital discord, teenage pregnancy, as well as with international differences in rates of violent crime (Barber, 2000; Secord, 1983; W. J. Wilson, 1990). Further, women tend to tolerate "bad behavior" (i.e., sex partner concurrency) from their partners when there is a perceived lack of partner choices (Adimora, et al., 2001). Both linear and quadratic forms of the female-to-male sex ratio were included in models to allow for possible nonlinearities in the relationship.

*Analyses*

All analyses were conducted in Stata 9.2. ArcMap was used to map county disadvantage scores, female-victim intimate partner homicide rates, and male-victim homicide rates. Poisson regression models with population offset terms were employed to examine both the crude and adjusted relationships between county disadvantage and gender-specific intimate partner homicide rates. Interactions between county disadvantage and county urbanicity were included to

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test for differential effects of county disadvantage by county urbanicity. A high alpha level (0.20) was used to test these interactions given the low power of these significance tests (Selvin, 2004). Mediation was empirically examined with the Baron and Kenny logical criteria for mediation: (1) the predictor is significantly related to the outcome, (2) the predictor is significantly related to the mediator, (3) the outcome is significantly related to the mediator, and (4) the effect estimate for the predictor changes substantially once the mediator is added to the model (Baron & Kenny, 1986). Although there is no consensus for what constitutes "substantial" change (MacKinnon, Lockwood, Hoffman, West, & Sheets, 2002), we considered a $\geq$20% change in the predictor effect estimate sufficient, consistent with a prior study (Halpern, Kaestle, & Hallfors, 2007).

## Results

*Descriptive Results*

Characteristics of intimate partner homicide decedents in North Carolina between 2004-05 (n=165) are presented in Table 6. The majority of victims were female (69.1%). The largest racial group represented was Whites (56.4%), followed by Blacks (39.4%), and Others (4.2%). About 6% of the victims were recorded as being of Hispanic ethnicity. The majority of suspected perpetrators were current or former boyfriends or girlfriends (56.4%), as opposed to current or former spouses (43.6%). The median victim age was 39 years, ranging from 15 to 84 years. The crude number of intimate partner homicides increased slightly between 2004 and 2005, although the rates decreased slightly between the years (1.08 to 1.04 per year per 100,000 population) due to state population growth.

Characteristics of North Carolina counties are presented in Table 7. Cumulatively across 2004-05, the average annual county intimate partner homicide rate per 100,000 population was 1.1 overall, 0.7 for female victims, and 0.4 for male victims. The average proportion of counties' population between ages 20-40 in 2000 was 27.5%, and the mean female-to-male sex ratio (multiplied by 100) for persons age 15 and above was 107.0. About three-quarters of counties

had at least one shelter located within their boundaries. Average per capita Federal and state funding for intimate partner violence services varied widely between counties, with an interquartile range of $1.4 - $5.0.

Table 8 presents counties' disadvantage characteristics, both overall and separately by quartile of county disadvantage. Overall, counties' average median income was $34,900; percent below poverty was 14.3%; percent of family households that were female-headed was 9.8%; percent unemployed was 4.4%; percent on public assistance was 3.2%; and percent of adults with less than a high school education was 26.0%. The disadvantage score derived from principal components analysis followed a standard normal distribution (mean=0, standard deviation=1). Average family income was negatively related to county disadvantage; all other indicators were positively related to county disadvantage except percent of female-headed households, which was only significantly associated with the highest quarter of disadvantage.

Figures 3-5 present maps of North Carolina counties with county disadvantage score, county female-victim homicide rate, and county male-victim homicide rate (respectively). The star represents the state capital (Raleigh), and darker shading indicates either a higher disadvantage score or higher intimate partner homicide rate. Visual examination of these maps can provide preliminary evidence of the geographic co-variation of county disadvantage and intimate partner homicide rates. Comparing Figures 3 and 4, there does not appear to be a strong geographic correspondence between county disadvantage and female-victim homicide rates. In contrast, comparing Figures 3 and 5 seems to suggest a stronger geographic correlation between county disadvantage and male-victim homicide rates. For example, there appear to be both elevated disadvantage scores and male-victim homicide rates along the Northern and Southern borders of the state.

*Female-Victim Model Results*

Results (incidence rate ratios and 95% confidence intervals) for female-victim Poisson regression models are presented in Table 9. In the first model, multiple tests were conducted to

assess overdispersion in the data; since none of the tests supported overdispersion, Poisson models were deemed appropriate. In the second model, the crude relationship between county disadvantage and female-victim intimate partner homicide is weakly positive and borderline significant: a one standard deviation increase in the county disadvantage score is associated with a 9% higher female-victim intimate partner homicide rate. Supplementary models run using a categorical specification of county disadvantage (i.e., quintiles, quartiles, or tertiles) did not suggest any non-linearities in this association (results available upon request). In the third model, all control variables were entered as well as interactions between county urbanicity and disadvantage. All such interaction p-values were greater than 0.20. Therefore, no interaction terms were maintained in the remaining analyses. Results from the final model indicate that the weakly positive crude relationship between county disadvantage and female-victim intimate partner homicide remains so after addition of controls for county demographic characteristics; however, its small magnitude and imprecision offer only weak evidence that female-victim homicide rates are related to county disadvantage. Also noteworthy is that none of the other included variables appears significantly related to female-victim homicide.

*Male-Victim Model Results*

Results (incidence rate ratios and 95% confidence intervals) for male-victim Poisson regression models are presented in Table 10. As with female victims, tests conducted for male victims using a null model do not suggest overdispersion, thus supporting use of a Poisson model. Results from the crude model (model 2) support a positive and statistically significant relationship between county disadvantage and male-victim intimate partner homicide rates: a one standard deviation increase in county disadvantage score is associated with a 16% higher male-victim homicide rate. Supplementary models run using categorical specifications of county disadvantage (i.e., quintiles, quartiles, or tertiles) did not suggest any non-linearities in this association (results available upon request). In model 3, all control variables as well as interactions between county disadvantage and urbanicity were entered; however, because no

interactions were significant even at a high p-value level (0.20), these interactions were dropped in model 4. Controlling for county demographic characteristics resulted in a stronger effect estimate for county disadvantage compared to the crude model: a one standard deviation increase in county disadvantage was associated with a 25% higher incidence rate for male-victim homicide.  Although this effect estimate did lose some precision relative to the crude model, it remained statistically significant at the 0.05 level.

*Mediation by Intimate Partner Violence Services Availability and Funding*

According to Baron and Kenny, the first logical criterion for mediation is that the main predictor variable be significantly related to the outcome (Baron & Kenny, 1986).  As this is not the case for female-victim homicide rates, further mediation assessment was conducted for male-victim homicide rates only. The second and third criteria for mediation require that the predictor be significantly related to the mediator and the mediator be significantly related to the outcome. Bivariate models testing the relationships between the mediator variables and both disadvantage (OLS models) and male-victim homicide rates (Poisson models) are presented in Table 11; both linear and categorical specifications of the mediator variables (where appropriate) were tested. As is apparent from this table, a number of mediator variables were significantly related to county disadvantage, including shelter availability, number of shelter beds, as well as per capita funding for intimate partner violence services.  However, none of the mediator variables examined was significantly associated with male-victim intimate partner homicide rates.  As such, none of the service availability or funding variables examined was supported as a mediator of the relationship between county disadvantage and male-victim intimate partner homicide.

## Discussion

Previous studies suggest that area disadvantage is positively related to female-victim intimate partner homicide. However, small-area studies have been limited to large urban centers (i.e., Chicago and New York); further, no studies to date have examined the relationship between

area disadvantage and male-victim intimate partner homicide. The purpose of this study was to address these gaps in the literature, contribute knowledge regarding socioeconomic disparities in intimate partner homicide across North Carolina counties, and explore possible mechanisms for any such disparities. There are five major findings in this study.

First, the rates of intimate partner homicide vary widely across North Carolina counties, with the rates of female-victim homicide, on average, greater than the rates of male-victim homicides. This finding of gender differences in rates is consistent with past research using national data (Fox & Zawitz, 2007), and suggests that females are more vulnerable to intimate partner homicide than males.

Second, county disadvantage appears positively related to male-victim but only weakly related to female-victim intimate partner homicide rates. These findings are consistent with past individual-level research which has found that socioeconomic status is more strongly related to male-partner murder than female-partner murder, because females with low socioeconomic status may be more likely to believe there is no other escape from abuse than through the killing of the male partner (Dugan, et al., 1999). However, these findings are inconsistent with past city-level studies, which found area disadvantage (i.e., community area disadvantage in Chicago, Census tract poverty in New York City) was positively related to female-victim intimate partner homicide. The divergent findings across studies may stem from differences in the data source used (NC-VDRS versus medical examiner reports alone), geographic unit examined (counties vs. smaller geographic units), the operationalization of community disadvantage (an index vs. a single poverty indicator), as well as the unit of time measured (a two-year annual average vs. a five-year annual average). Since the number of intimate partner homicides in the NC-VDRS is still modest, it is desirable that the findings reported here be confirmed after more years of data have accumulated.

Third, findings indicate that effect estimates of county disadvantage do not vary as a function of county urbanicity for either male or female-victim intimate partner homicide. These

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findings are generally consistent with social disorganization theory which, as a general theory of crime and deviance, would not predict differences in the effects of area disadvantage by community urbanicity. Although rates of intimate partner violence and intimate partner homicide may indeed vary as a function of area urbanicity (Gallup-Black, 2005), the present study suggests that area-level disadvantage does not appear to differently affect the etiology of these incidents according to area urbanicity. Further examination utilizing smaller geographic units (i.e., Census tracts or block groups) may be worthwhile, especially given differences with prior urban-based studies mentioned in the prior paragraph, to test the sensitivity of findings to geographic scale.

Finally, current analyses did not support any of the included service availability or service funding variables as possible mediators of the relationship between county disadvantage and male-victim intimate partner homicide. This finding was unexpected, given past research documenting an inverse relationship between county disadvantage and shelter service availability (Tiefenthaler, et al., 2005), and research documenting a relationship between increased victims' services availability and declining rates of male-victim intimate partner homicide (Dugan, et al., 1999; Dugan, et al., 2003). There are a number of possible explanations for not observing a relationship between the included service availability variables and male-victim intimate partner homicide. First, it is possible that although services are available, their inaccessibility may hinder their use by vulnerable groups. Various aspects of accessibility, including adequate outreach and connection to other community agencies and health care providers, flexible accommodation of victims' children and pets, as well as cultural and linguistic competence of shelter staff could all affect whether available services are utilized (Faver & Strand, 2003; Grigsby & Hartman, 1997; Violence Working Group, 2002). Another possibility is that male-victim intimate partner homicide reflects at least two different types of pre-existing partner violence: one in which the male is a perpetrator against his female partner, and one in which the violence is unidirectional, female against male. Although research suggests the majority of male-victim intimate partner homicide results from the former type of pre-existing condition (Dugan, et al., 1999), not all such

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homicides do. In the cases where the pre-existing partner violence is unidirectional female-against-male, it is unlikely availability of shelter services would affect subsequent male-victim homicide, since shelter services are largely unavailable to male victims (Douglas & Hines, 2008; Hines, Brown, & Dunning, 2007). Therefore the mixture of these two types of male-victim homicide may hamper our ability to detect an association between shelter services' availability and male-victim homicide. Future research that can distinguish between these two typologies is needed to further examine mediational pathways.

Although this study has many strengths, including the use of a statewide registry of violent deaths and statewide annually-collected intimate partner violence services data, there are a number of limitations. First, intimate partner homicide is a rare event, especially for male victims. We averaged annual rates across two years to reduce estimates' instability; confidence limit ratios for the disadvantage effect estimates were 1.28 for female-victim homicides, and 1.41 for male-victim homicides, indicating relatively good precision. However, given that 71% of counties experienced 0-1 female deaths and 92% experienced 0-1 male deaths cumulatively during the study years, repeating analyses using more years of data would provide more confidence in the results. Findings that none of the included variables was significantly related to female-victim homicide may reflect this lack of power in our analysis. As mentioned above, repeating analyses once more years of data have been accumulated in the NC-VDRS, or using data from other states that have been participating longer in the National Violent Death Reporting System, may help test the robustness of findings. A second limitation is the lag between when our disadvantage index was measured (2000) and the years when the deaths took place (2004-05). If counties rapidly changed during the intervening years on some of the indicators included in the disadvantage index, the index may not reflect counties' disadvantage at the time the intimate partner homicides occurred. However, since this lag is relatively short, we believe it is unlikely that county-level demographic characteristics would change sufficiently to affect counties' disadvantage score. Finally, the NC-VDRS may under-ascertain or incorrectly identify intimate

partner homicide, since information on the victim-to-suspect relationship derives from the initial incident response report by law enforcement (Biroscak, Smith, & Post, 2006; Paulozzi, Saltzman, Thompson, & Holmgreen, 2001). At the time of this initial report, the identity of the perpetrator will often not be known, and a suspected perpetrator may be cleared in subsequent investigations. Future research linking NC-VDRS data with conviction data may help identify (or de-identify) some incidents currently included in the analysis.

In the present analysis, county disadvantage was found to be related to male-victim but not female-victim intimate partner homicide. Associations did not vary by county urbanicity; further, victims' service availability and funding did not appear to mediate the relationship between county disadvantage and male-victim homicide. Further research exploring the mechanisms underlying differences in counties' male-victim homicide rates according to country disadvantage is warranted. As suggested above, separating out male-victim intimate partner homicides by prior abuse history could result in different conclusions regarding the mediating role of victims' services availability. However, further exploration of other mediating mechanisms is warranted, including an examination of service accessibility as well as law enforcement responses to prior incidents. Finally, replicating analyses using different geographic units (i.e., different states, smaller geographic units within North Carolina) could also shed light on the generalizeability of findings, as well as the appropriate geographic unit on which analyses should be conducted.

**Table 6. Homicide Victim Characteristics, 2004-05 (n=165)**

|  | N (%) |
|---|---|
| Gender | |
|     Male | 51 (30.9%) |
|     Female | 114 (69.1%) |
| Race | |
|     White | 93 (56.4%) |
|     Black | 65 (39.4%) |
|     Other | 7 (4.2%) |
| Hispanic | 9 (5.5%) |
| Perpetrator | |
|     Spouse/Ex-Spouse | 72 (43.6%) |
|     Girlfriend/Boyfriend, current or ex | 93 (56.4%) |
| Year of death | |
|     2004 | 77 (46.7%) |
|     2005 | 88 (53.3%) |
|  | **Mean (SD)** |
| Age, years | 39.8 (13.8) |

**Table 7. North Carolina Counties (n=100): Intimate partner violence deaths 2004-05, partner violence services 2004-06, and Census characteristics 2000**

| | Mean (SD) | Median | Interquartile Range |
|---|---|---|---|
| **Census characteristics, 2000** | | | |
| Population, 2000 (thousands) | 80.5 (108.1) | 47.9 | 23.9 – 91.6 |
| Percent population age 20-40 | 27.5 (3.9) | 27.7 | 25.5 – 29.3 |
| Female:Male sex ratio, ages 15 and above | 107.0 (7.4) | 106.8 | 104.2 – 111.3 |
| | | | |
| **Partner violence services** | | | |
| Average annual per capita funding for IPV services, 2004-06 | $3.6 ($3.1) | $2.8 | $1.4 - $5.0 |
| Average annual shelter days full, 2004-05 | 147.6 (236.0) | 52.5 | 1.5 – 209.0 |
| Average annual shelter referrals, 2004-05 | 19.4 (35.6) | 6 | 0.0 – 28.0 |
| | | | |
| **Intimate partner homicide** | | | |
| Total deaths, 2004-05 | 1.7 (2.4) | 1 | 0 – 2 |
| Female deaths, 2004-05 | 1.1 (1.7) | 1 | 0 – 2 |
| Male deaths, 2004-05 | 0.5 (1.0) | 0 | 0 – 1 |
| Overall rate per 100,000 pop. | 1.1 (1.1) | 0.9 | 0 – 1.6 |
| Female rate | 0.7 (1.0) | 0.3 | 0 – 1.0 |
| Male rate | 0.4 (0.7) | 0.0 | 0 – 0.4 |
| | **N (%)** | | |
| **Census characteristics** | | | |
| Urbanicity | | | |
| Urban, metropolitan | 40 (40%) | -- | -- |
| Urban, nonmetropolitan | 39 (39%) | | |
| Rural | 21 (21%) | | |
| | | | |
| **Partner violence services** | | | |
| Has a shelter in the county, 2008[a] | 73 (73%) | -- | -- |

[a] If shelter capacity in 2008 was recorded as being greater than zero, this was taken as an indicator of there being a shelter in the county. Shelter capacity information was first collected by

NCCW in 2005-06, but many counties had missing data.  The next year such data were available was 2008. Although capacity has changed in the intervening years, the location of shelters has not (personal communication with Tara Minter).

**Table 8. Mean county disadvantage characteristics, overall and by disadvantage index quartile (n=100)**

| | Overall | Disadvantage Index Quartiles | | | |
| --- | --- | --- | --- | --- | --- |
| | | Quartile 1 | Quartile 2 | Quartile 3 | Quartile 4 |
| Median income (thousands $) | 34.9 (57.6) | 41.7 (4.8) | 36.6 (2.6) | 32.3 (2.4) | 28.9 (2.2) |
| Percent below poverty | 14.3 (4.3) | 10.5 (2.4) | 11.7 (1.8) | 15.0 (2.5) | 20.0 (2.2) |
| Percent families single mother | 9.8 (3.1) | 8.7 (2.2) | 8.9 (2.1) | 8.5 (2.9) | 13.0 (2.9) |
| Percent unemployed | 4.4 (1.3) | 3.2 (0.5) | 4.0 (0.6) | 4.4 (0.9) | 6.1 (1.1) |
| Percent on public assistance | 3.2 (1.4) | 2.0 (0.5) | 2.7 (0.6) | 3.3 (0.9) | 5.0 (1.1) |
| Percent adults with less than high school education | 26.0 (6.3) | 18.4 (3.9) | 24.7 (4.4) | 29.3 (3.6) | 31.7 (3.1) |

**Figure 3. Disadvantage score in North Carolina Counties, 2000**



Disadvantage Score

-4.32 - 2.32
-2.32 - -1.02
-1.02 - 0.51
0.51 - 2.16
2.16 - 4.47

**Figure 4. Female-victim intimate partner homicide rates per 100,000 population in North Carolina counties, annual average 2004-05**



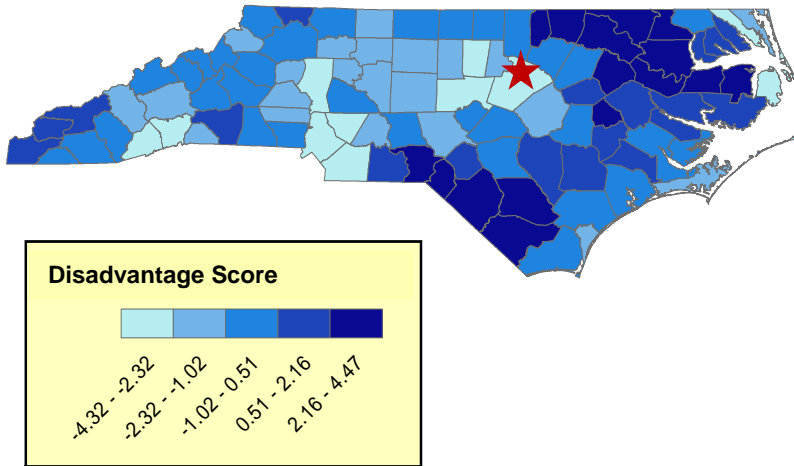Female Rate
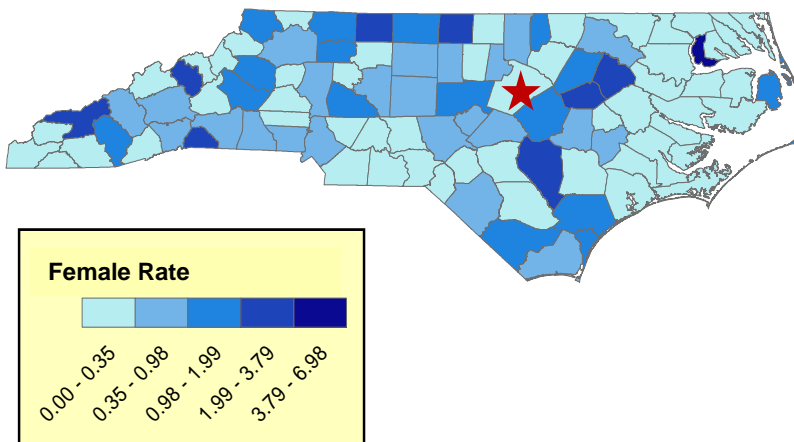
0.00 - 0.35
0.35 - 0.98
0.98 - 1.99
1.99 - 3.79
3.79 - 6.98

**Figure 5. Male-victim intimate partner homicide rates per 100,000 population in North Carolina counties, annual average 2004-05**



Male Rate

0.00 - 0.16
0.16 - 0.55
0.55 - 0.98
0.98 - 1.97
1.97 - 3.8

**Table 9. Poisson regression results: Incidence rate ratios for female-victim intimate partner homicide, 2004-2005**

| | Incidence Rate Ratios (95% Confidence Intervals) | | | |
| --- | --- | --- | --- | --- |
| | **Model 1: Null** | **Model 2** | **Model 3** | **Model 4** |
| **Predictors** | | | | |
| Disadvantage | | $1.09 \ (1.00 - 1.19)^{\dagger}$ | $1.13 \ (0.95 - 1.35)^{\S}$ | $1.08 \ (0.95 - 1.22)$ |
| Percent Age 20-40 | | | $0.98 \ (0.92 - 1.04)$ | $0.97 \ (0.92 \ \text{-}1.03)$ |
| Sex ratio | | | $1.70 \ (0.76 - 3.78)^{\S}$ | $1.65 \ (0.76 - 3.57)$ |
| Sex ratio, squared | | | $1.00 \ (0.99 - 1.00)$ | $1.00 \ (0.99 - 1.00)$ |
| Urbanicity | | | | |
| Urban, metro | | | Referent | Referent |
| Urban, nonmetro | | | $0.95 \ (0.57 - 1.56)$ | $0.99 \ (0.60 - 1.64)$ |
| Rural | | | $1.24 \ (0.43 - 3.51)$ | $0.92 \ (0.33 - 2.58)$ |
| Interactions | | | | |
| Urban nonmetro*disadvantage | | | $0.94 \ (0.75 - 1.18)$ | -- |
| Rural*disadvantage | | | $0.68 \ (0.38 - 1.22)$ | |
| **Model fit** | | | | |
| Pseudo-$R^2$ | -- | 0.02 | 0.05 | 0.04 |
| Likelihood Ratio $X^2$ (df) | -- | $3.47(1)^{\dagger}$ | $11.05 \ (8)^{\S}$ | $9.23 \ (6)^{\S}$ |
| Goodness-of-fit $X^2$ (df)[a] | 93.74 (99) | 90.27 (98) | 82.69 (91) | 81.99(93) |

$^{\S}$p<0.20    $^{\dagger}$p<0.10    *p<0.05    **p<0.01    ***p<0.001

[a] Additional goodness-of-fit tests (square root of the ratio of the model deviance to the degrees of freedom, square root of the ratio of the model Pearson statistic to the degrees of freedom) also suggested overdispersion was not present in the data.
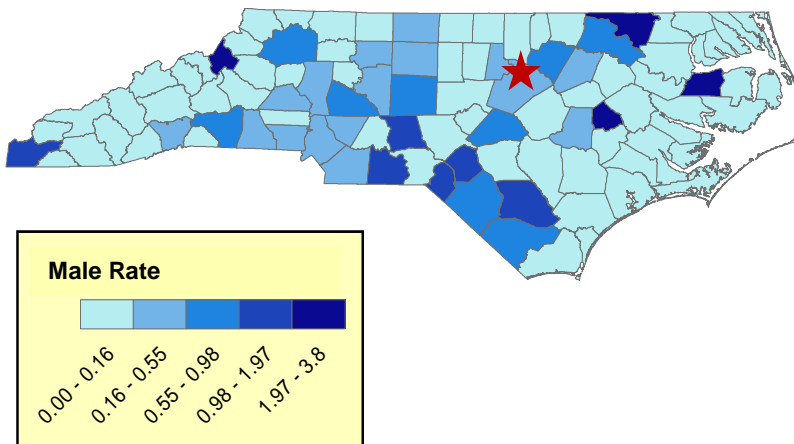
53

**Table 10. Poisson regression results: Incidence rate ratios for male-victim intimate partner homicide, 2004-2005**

| | Incidence Rate Ratios (95% Confidence Intervals) | | | |
|---|---|---|---|---|
| | **Model 1: Null** | **Model 2** | **Model 3** | **Model 4** |
| **Predictors** | | | | |
| Disadvantage | | 1.16 (1.02 – 1.31)* | 1.13 (0.88 – 1.46) | 1.25 (1.05 – 1.48)* |
| Percent Age 20-40 | | | 1.02 (0.93 – 1.02) | 1.03 (0.94 -1.13) |
| Sex ratio | | | 2.22 (0.77 – 6.41)$^{\S}$ | 2.35 (0.77 – 7.10)$^{\S}$ |
| Sex ratio, squared | | | 1.00 (0.99 – 1.00)$^{\S}$ | 1.00 (0.99 – 1.00)$^{\S}$ |
| Urbanicity | | | | |
| Urban, metro | | | Referent | Referent |
| Urban, nonmetro | | | 1.03 (0.46 – 2.30) | 0.97 (0.45 – 2.08) |
| Rural | | | 1.04 (0.14 – 7.76) | 1.40 (0.34 – 5.75) |
| Interactions | | | | |
| Urban nonmetro*disadvantage | | | 1.19 (0.84 – 1.68) | -- |
| Rural*disadvantage | | | 1.34 (0.60 – 2.98) | |
| **Model fit** | | | | |
| Pseudo-$R^2$ | -- | 0.03 | 0.07 | 0.06 |
| Likelihood Ratio $X^2$ (df) | -- | 4.81 (1)* | 10.53 (8) | 9.30 (6)$^{\S}$ |
| Goodness-of-fit $X^2$ (df)$^{a}$ | 74.84 (99) | 70.03 (98) | 64.31 (91) | 65.54 (93) |

$^{\S}$p<0.20    $^{\dagger}$p<0.10    *p<0.05    **p<0.01    ***p<0.001

[a] Additional fit tests (square root of the ratio of the model deviance to the degrees of freedom, square root of the ratio of the model Pearson statistic to the degrees of freedom) also suggested overdispersion was not present in the data.

**Table 11. Male-Victim Intimate Partner Homicide and County Disadvantage: Possible Mediators**

| | Disadvantage[a] | | Male-Victim Intimate Partner Homicides[b] | |
|---|---|---|---|---|
| | Est. β (95% CI) | p-value | IRR (95% CI) | p-value |
| County has a shelter | -1.14 (-2.01 - -0.27) | 0.010 | 0.53 (0.26 – 1.09) | 0.085 |
| Number of shelter beds, 2005-06 | -0.07 (-0.11 - -0.04) | <0.001 | 1.00 (0.99 – 1.01) | 0.932 |
| Number of shelter beds, 2005-06 | | | | |
|     0 beds | Referent | 0.003 | Referent | 0.928 |
|     1-10 beds | -1.01 (-2.31 – 0.28) | | 0.98 (0.40 – 2.43) | |
|     11-20 beds | -0.66 (-1.57 – 0.24) | | 1.04 (0.70 – 1.53) | |
|     >20 beds | -2.16 (-3.29 – -1.02) | | 0.95 (0.66 – 1.36) | |
| Per capita funding for DV services, 2004-06 | 0.21 (0.09 – 0.33) | 0.001 | 1.04 (0.95 – 1.13) | 0.921 |
| Per capita funding for DV services, 2004-06 | | | | |
|     Quartile 1 ($0.38 - $1.42) | Referent | <0.001 | Referent | 0.450 |
|     Quartile 2 ($1.42 - $2.71) | 1.41 (0.40 – 2.42) | | 1.30 (0.91 – 1.87) | |
|     Quartile 3 ($2.91 - $4.96) | 2.33 (1.32 – 3.34) | | 1.22 (0.75 – 2.00) | |
|     Quartile 4 ($4.98 - $19.23) | 2.10 (1.09 – 3.11) | | 1.12 (0.57 – 2.23) | |
| Number of days shelter is full, 2004-05 | 0.00 (-0.00 – 0.00) | 0.666 | 1.00 (1.00 – 1.00) | 0.327 |
| Number of days shelter is full, 2004-05 | | | | |
|     Quartile 1 (0-1 days) | Referent | 0.049 | Referent | 0.483 |
|     Quartile 2 (2-42 days) | -0.70 (-1.80 – 0.39) | | 0.90 (0.59 – 1.38) | |
|     Quartile 3 (63-208 days) | -1.09 (-2.18 – 0.00) | | 0.77 (0.49 – 1.21) | |

| | | | | |
|---|---|---|---|---|
| Quartile 4 (210-1,161 days) | 0.32 (-0.78 – 1.41) | | 0.75 (0.46 – 1.23) | |
| Number of shelter referrals made, 2004-05 | -0.01 (-0.02 – 0.00) | 0.067 | 1.00 (0.99 – 1.00) | 0.405 |
| Number of shelter referrals made, 2004-05 | | | | |
| Quartile 1 (0 referrals) | Referent | 0.168 | Referent | 0.815 |
| Quartile 2 (1-6 referrals) | -1.04 (-2.19 – 0.12) | | 0.68 (0.44 – 1.05) | |
| Quartile 3 (7-26 referrals) | -1.04 (-2.10 – 0.03) | | 0.83 (0.53 – 1.29) | |
| Quartile 4 (30-216 referrals) | -0.59 (-1.61 – 0.43) | | 0.60 (0.41 – 0.89) | |

[a]Results from OLS regression models.

[b]Results from Poisson regression models with a population offset term.

**CHAPTER 4: Conclusion**

The purpose of this dissertation is to explore the relationship between contextual socioeconomic disadvantage and various intimate partner violence outcomes in adolescence and adulthood. Although numerous studies have documented individual, couple and micro-system (i.e., family and peer systems) level risk factors for partner violence, less is known about how wider social contexts (i.e., schools and communities) contribute to partner violence directly, indirectly through their influence on more proximal risk factors, or by modifying the effects of these more proximal factors. Given the importance of an ecological systems perspective in public health, exploration of these wider systemic influences is an important gap to address. Within this systems framework, several theoretical models from social science literatures were used (Social Disorganization Theory, Relative Disadvantage Theory, and Gendered Resource Theory) to predict the relationship between contextual disadvantage and partner violence. There are a number of conclusions that may be drawn from these studies, as well as lessons for future research in this area.

In the first paper, contextual disadvantage (measured at the school level) is related to adolescent dating violence victimization through its modifying effects on the relationship between family disadvantage and dating violence victimization among female adolescents – family disadvantage is more strongly related to females' victimization in more advantaged schools. However, neither family nor school disadvantage is related to male adolescents' victimization. These findings extend past studies which did not support a relationship between neighborhood disadvantage and adolescent dating violence perpetration (Foshee, Karriker-Jaffe, et al., 2008), and that related within-couple relative disadvantage among adults to male but not

female violence perpetration (Anderson, 1997). Such results support gendered resource theory, which holds that relative disadvantage is more likely to lead to violence perpetration by males (i.e., victimization by females in heterosexual relationships) because such relative disadvantage is more threatening to traditional masculine identities than to traditional feminine identities. Findings suggest that perhaps schools with greater socioeconomic disparities should be prioritized for dating violence interventions. Although further research examining mediating mechanisms is warranted, results also suggest that programs to help adolescents challenge traditional conceptions of masculinity and femininity, or self-worth tied to relative socioeconomic position, may help to stem some forms of dating violence.

In the second paper, county disadvantage is unrelated to female-victim intimate partner homicide, but is positively related to male-victim homicide.  In neither case does the relationship vary as a function of county urbanicity. Further, none of the examined victims' services variables is supported as a mediator of the relationship between county disadvantage and male-victim intimate partner homicide rates. These results contrast with prior ecological studies of large urban areas, which found a positive relationship between neighborhood disadvantage and female-victim homicide (Browning, 2002; Frye & Wilt, 2001). Differences in the geographic unit studied, sources of data on homicide, and measurement of disadvantage may contribute to these differences across studies. Findings from the present analysis are partially consistent with Social Disorganization Theory, in that county socioeconomic disadvantage was related to male-victim homicide and did not vary by county rurality. It is possible that other factors are more important mediators of the relationships between disadvantage and male-victim intimate partner homicde (e.g., service accessibility and/or law enforcement responses to prior domestic incidents). Alternatively, the inability to distinguish between unidirectional and bidirectional female-against-male partner violence dampens our ability to detect a relationship between shelter service availability and male-victim homicide. Future research should continue efforts to identify mechanisms behind this relationship.  Such research may include linking data sources that can

distinguish between homicides resulting from pre-existing unidirectional versus bidirectional partner violence, examining the other possible mediators mentioned above and law enforcement responses, and utilizing data from a longer time period to increase analytic power.

Across both studies, gender emerges as an important modifying factor in the relationship between disadvantage and partner violence victimization. Nationally-representative studies generally find roughly equal prevalence of minor physical victimization and perpetration for females and males (Catalano, 2006; Halpern, et al., 2001). However, risk factors for and consequences of partner violence victimization often differ between males and females during both adolescence and adulthood. For example, in the adolescent dating violence literature, there are both shared and unique risk factors for victimization onset among females and males (Foshee, et al., 2004; O'Keefe & Treister, 1998). Further, female adolescents are more likely than males to report perpetrating violence only in response to violence initiated by their partner (O'Keefe & Treister, 1998). In the adult partner violence literature, childhood abuse appears more strongly directly related to male-perpetrated than female-perpetrated partner violence (Herrenkohl, et al., 2004), and individual socioeconomic status is more strongly related to male-victim than female-victim partner homicide (Dugan, et al., 1999).

Gender similarities and differences are also evident in the consequences of victimization. Among adolescents, onset is associated with increased depressive symptoms for both males and females, although females report greater fear of their partner as a consequence of the incident (Foshee, et al., 2007; O'Keefe & Treister, 1998). Among adults, numerous studies have documented that female victims are at increased risk for injury relative to male victims in partner violence incidents, and that the costs of care for intimate partner violence victims are greater for females than males (Arias & Corso, 2005). All of these findings, in addition to the results from this dissertation, suggest that researchers should explore the possibility of gender differences in the etiology of partner violence. Despite the disproportionate burden of negative outcomes among women, researchers still should examine the causes and consequences of partner violence

victimization among men, as they also suffer depression, injury, and homicide as a result of such victimization, even if they do so at a rate that is lower than among females.

Consistent with the ecological model of health, both papers also support some influence of contextual disadvantage in the etiology of partner violence, although whether this relationship is direct or moderating differs. In the first study, which examines minor victimization among adolescents using individual-level data, disadvantage modifies the association between family disadvantage and victimization, but only among females. In the second study, which examines intimate partner homicide among adolescents and adults using ecological data, disadvantage is directly related to male-victim but not female-victim homicide. Although the gender differences at first appear contradictory across studies, they should be understood within the context of other studies which find that male-victim intimate partner murder is strongly linked with prior severe victimization of the female partner (Dugan, et al., 1999). Further, differences across studies in severity of outcome studied, age groups examined, and level of data utilized could also contribute to such seemingly disparate findings. Future research should continue to explore the potential effects of contextual disadvantage along the continuum of partner violence severity, especially focusing on potential mediators of these effects. In addition to the recommendations made in this dissertation, such results can suggest whether specific partner violence services should be targeted to or improved in disadvantaged schools and/or communities. Findings may also shed light on whether the effects of proximal risk factors targeted by current programs have varying importance to partner violence across different socioeconomic contexts.

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